



ISSN: 2319-5967

ISO 9001:2008 Certified

International Journal of Engineering Science and Innovative Technology (IJESIT)

Volume 2, Issue 1, January 2013

Intelligent Agents: Personalization and Filters

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Abstract— With the massive amounts of information on the WEB and also in local Knowledge bases. There are lot of existing tools and technologies to get the content to users. Rather than the user having to personalize and filter the data to get to the right content the complexity needs to be pushed down to the agents so only the useful information is passed to users. Multi Agent systems represent a new way to build complex systems. Agents are very well suited to automate and code modular type programs. This paper will discuss how a multi agent system can be developed which acts as an information retrieval agent, personal agent, and filtering agent to deliver the appropriate content to users.

Index Terms— Intelligent Multi Agent systems, Personalization, Information Filtering, Jade systems.

I. INTRODUCTION

As of 25th July 2008, Google software engineers Jesse Alpert and Nissan Hajaj announced that Google Search had discovered one trillion unique URLs [1]. The ease of duplication of data and ease of transmission of data across the internet has added more to information overload problems. Information stored is human readable not machine readable so there is a lack of means of comparing and processing information. Not just the information overload the number of communication channels has also increased like individual web pages, blogs, forms, social networking sites [2]. Lot of times the content on the web is from individuals so there is no easy way to verify the integrity and quality of the information. Not just the sanity of the information there is lot of unwanted and inappropriate content. The majority of unwanted content that has been reported quite often are the unsolicited commercials promoting services and products including cheap drugs and herbal supplements, health insurance, travel tickets, hotel reservations, and software products. Malicious code, such as viruses, worms and Trojan horses, have been delivered via email and executed by unwitting recipients [3]. The goal is to tackle the information overload and sanity issues through personalization and filtering techniques. Multi agents are very versatile in solving complex real world problems and this technology will be used in this paper. Multiple interactive agents solve the information overload problem at the same time intelligence is added in them to personalize the content and apply the appropriate filters based on user profile and other settings. The rest of the paper is organized as follows: Section 2 talks about the objective for developing the system, Section 3 goes over the implementation details and Section 4 concludes the paper.

II. OBJECTIVES

Personalization techniques provide optimized access to content and services, based on the preferences and the characteristics of each individual user. Nowadays many applications, either Web-based or not, call for personalized behavior. Obviously, such behavior leads to an increased demand for knowledge management, since personalization is based on user profiles, user preferences, usage policies, and other knowledge components [5]. The aim is not just providing the right content very effectively and efficiently but also to hide the complexities. Getting the proper content not only saves time from having users sort through hordes of unwanted stuff but also where internet service is still a luxury or where the connection speeds are low it is very crucial to get to the target data in less page clicks. User wants can be collected through user profiles and preferences and their behaviors can be tracked and logged so that can be used for customization when data is returned in future. User profile data can be updated at any time as specifics about their wants or environment change. The same goes with their behavior data which is stored in the application database and it is continually tracked and updated.

A multi-agent system is one in which a number of agents cooperate and interact with each other in a distributed environment. It has the potential to improve the theory and the practice of modeling, designing and implementing complex computer systems. The primary role of agent-based software is to solve complex, real world problems. The development of robust and scalable software systems requires autonomous agents that have the capability to accomplish their objectives while situated in a dynamic and uncertain environment [3].



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Efforts towards the automation of the information filtering process have delivered quite a lot of results but still lacked the degree of personalization that is needed to really find and deliver the right information to a *specific* user [4]. Agents are well suited for use in applications that involve distributed computation or recurrent communication between components. Multi-agent systems have been widely used in Web applications [6, 7] and also specifically as filtering agents [10].

III. IMPLEMENTATION

Intelligent Multi Agents which are used in this paper are developed using JADE (Java Agent Development Framework) [8] in compliance with FIPA specifications. Jade Gateway [9] tutorial shows how to integrate Jade API into the front end Servlets and JSPs. MYSQL database is used to store user profile and all required filtering criteria.

A. Personalization

Every user has specific needs why they access or use a system. With the vast amounts of information on the web and different modes of communication it is very important to capture user's wants and needs to provide optimized access, presentation and retrieval of the information to the user.

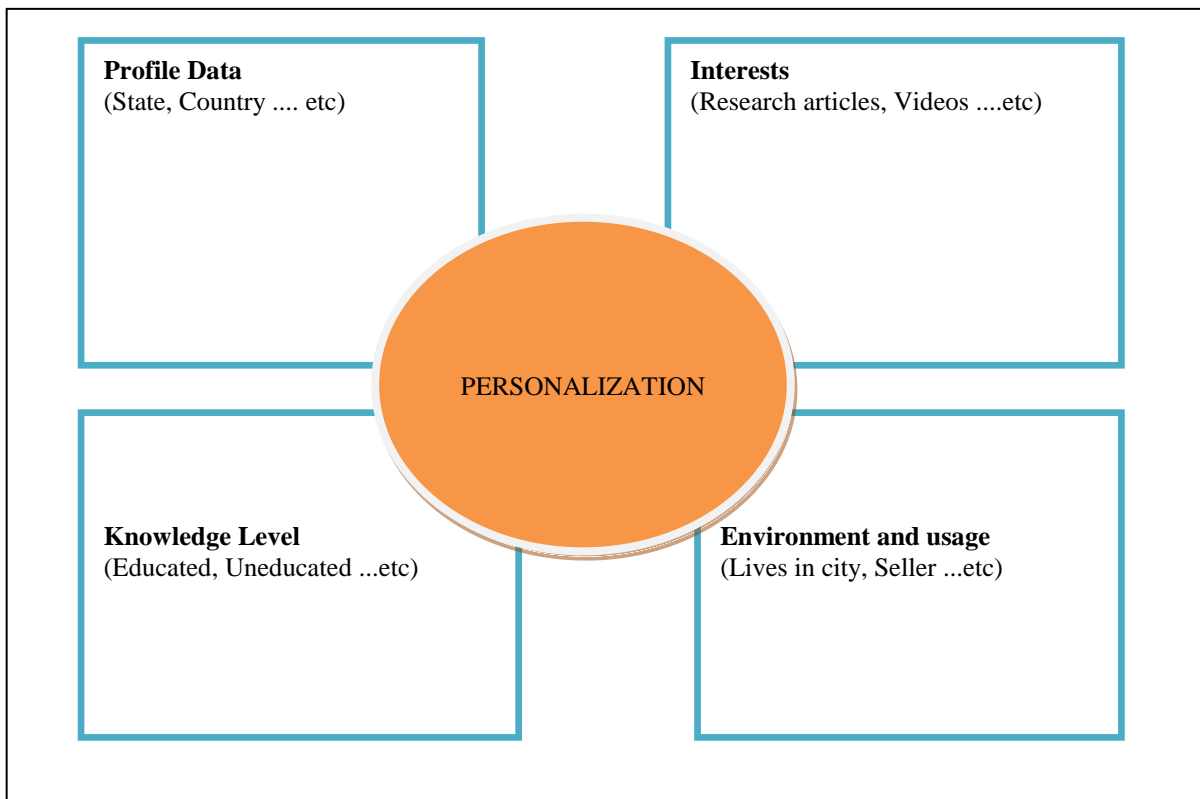


Fig 1: Various personalization techniques

Most of the personalization information is collected when a new user is created through User Profile page. This information is stored in the database and is used when displaying content to users. The front end also allows users to update their profile information at any time. A sample of the user profile screen is given below.



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The form contains the following fields:

- Enter Your User Name: [text input]
- Enter Your Password: [text input]
- Enter Your E-mail: [text input]
- Enter Your Address: [text input]
- Select your Language: [dropdown menu]
- Select a state: [dropdown menu]
- Select the first page to load: [dropdown menu]
- Select a Crop: [dropdown menu]
- Enter your internet connection speed (kbytes/sec): [text input]
- Enter the amount of your farm land (hectares): [text input]
- Select your main role in Farming industry: [dropdown menu]
- Enter you education level: [dropdown menu]
- Enter the amount of farming experience you have in yrs: [text input]

Fig 2: Sample of user data collected to personalize data

Below are some of the ways in which user profile information is used to personalize content:

- Location information collected is used to get content related to their particular place without having to specify it on all related screens. Location information particularly like pin code can be used for personalized services like getting weather content to the users.
- Even in a particular domain not all users are interested in the same core areas. List of the core areas offered by the application are listed in user profile based on their selection that particular content is searched for first.
- Users can specify which page they would like to see as their default home page. This will minimize their page clicks and unnecessary page loads.
- The same content can mean a world to some and totally unrelated to others based on their past experience and knowledge level. Even when two people are looking for the same information "Research articles" will be totally in a different genre and an uneducated person can make very little use of it. Their experience and knowledge levels are captured to further personalize their content.
- The role of the user in their real life matters a lot. The content an ordinary user wants to see should be completely different from what a retail seller in the same field would like to see.

B. Feedback and Filters

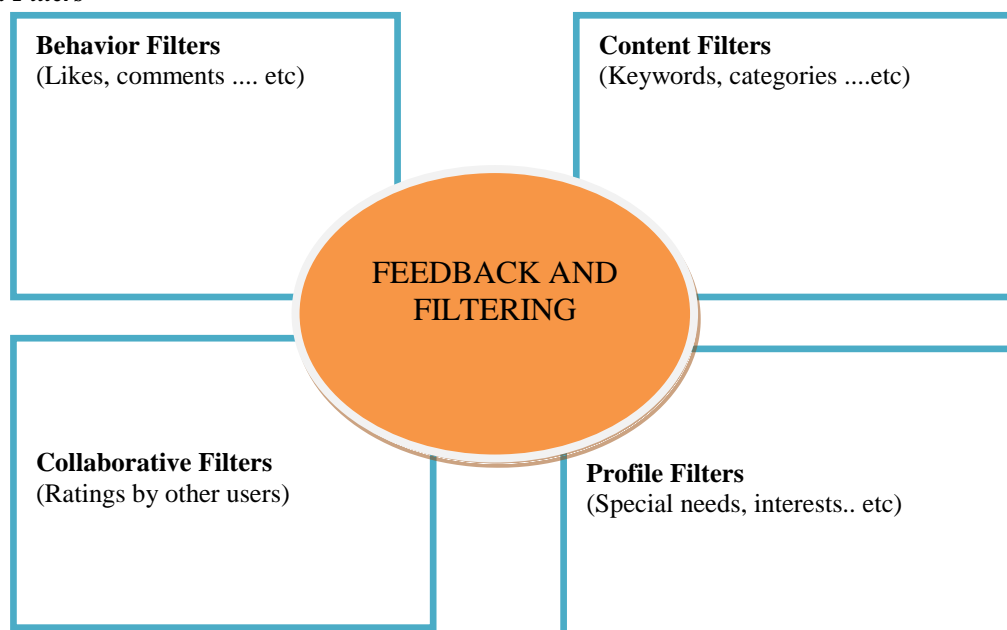


Fig 3: Various feedback and filtering techniques



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- Users can rate the content that is in local repository at any time. When a user provides a rating it means they like the content they have been presented with and in future would like to see similar content. All the data in the local repository has some keywords attached to it to identify the content like “organic farming”, “tips”, “fertilizers” ...etc. Each time a user likes content the keywords for that are stored in their user profile. One type of filtering that can be done is based on these keywords so users can see content which they might be interested based on past viewing history.
- Content based filtering is based on keywords entered by users. User Profile Agent gets users preferences to further filter the results. A background agent runs continuously to get titles of all the content and these are stored in a separate “user preferences” table. When a user tries to enter keywords auto fill feature will pull the titles from this user preferences table this will help users enter the proper keywords for searching. Knowing what to search for and giving the right search keywords is also as important as the data.
- Collaborative filtering works on ratings given by all the users of the system. Knowledge and experience of other users will be captured by the ratings. And these cumulative ratings provide valuable information to other users.
- High speed internet access is a luxury in many rural areas. The point of personalization is to get the right content to users but if the pages never load then none of the customizations are worth the effort. Special filters will be applied for content with high download times. These filters look at users internet connection speeds specified in user’s profile and provide appropriate content to users.

IV. CONCLUSION

In this fast faced world with data flowing from every nook and corner it is imperative to get the genuine and applicable information. This laborious process can be eased by using existing customization tools. This research shows how goal oriented Intelligent Agents use Personalization and Filtering techniques to further enhance the process. The agents take up three different roles. They can be executing straightforward queries with predefined rules or executing a well defined request from user or act as predicate agent and volunteer information to user. The outcome of this straining process delivers effective and only required content to users. Future work includes the development of an enhanced user profile updating process based on web usage analysis and the adaption of this system to work in different contexts. Linguistic filtering techniques will also be considered to further enhance the filtering process. Care should be taken not to overdo the personalization that users cannot see anything beyond their boundaries.

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